Joint Polar Satellite System (JPSS)

JPSS ATMS OVERVIEW

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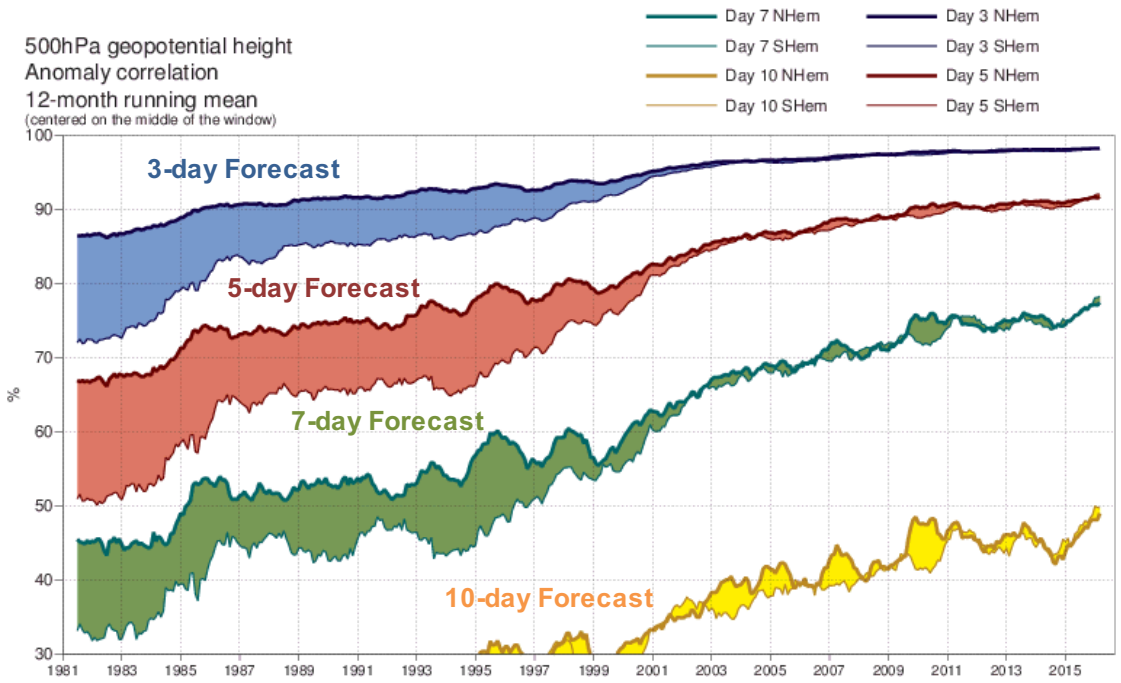
Joint Polar Satellite System
National Environmental Satellite, Data, and Information Service
U.S. National Oceanic and Atmospheric Administration
U.S. Department of Commerce

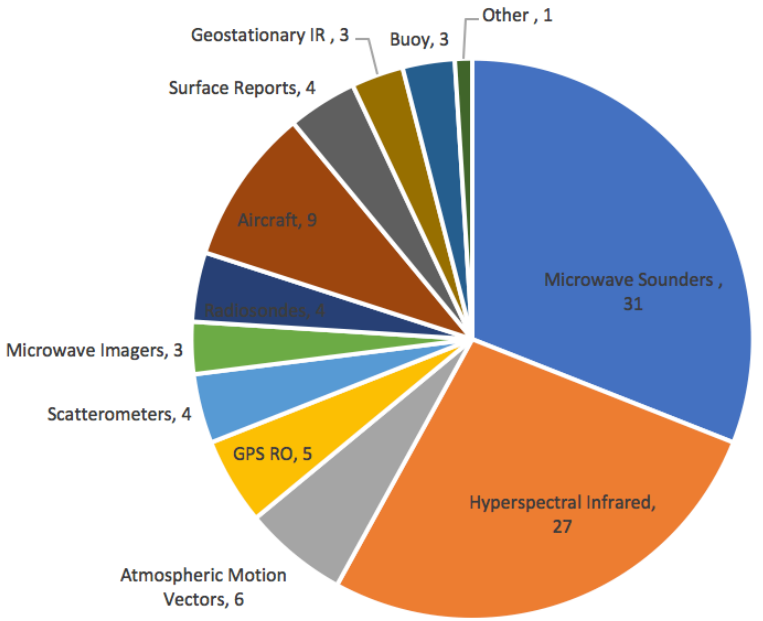
Why polar? Why JPSS?

Microwave and Infrared Sounders have Huge Impacts in Forecasts



Credit: ECMWF

Observation Type and % Impact to Reducing Forecast Errors



Advanced Technology Microwave Sounder (ATMS)

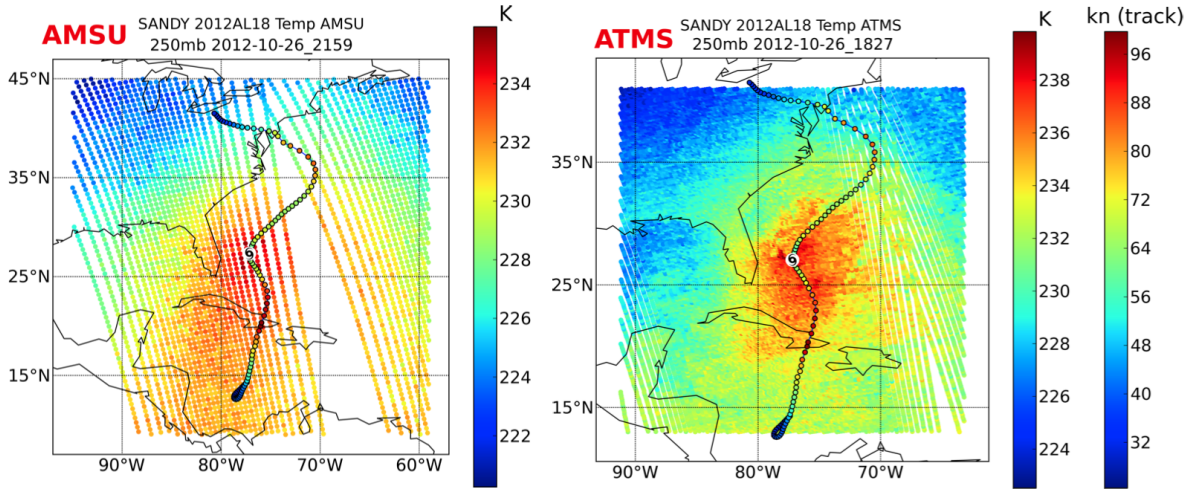
Sounding data provides:

- 3-D temperature and moisture profiles
- Rainfall rates
- Snow/ice information

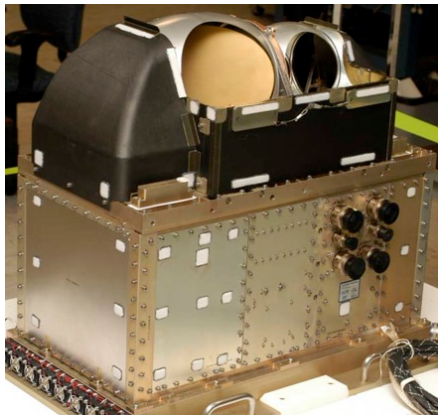
Sounding data improves:

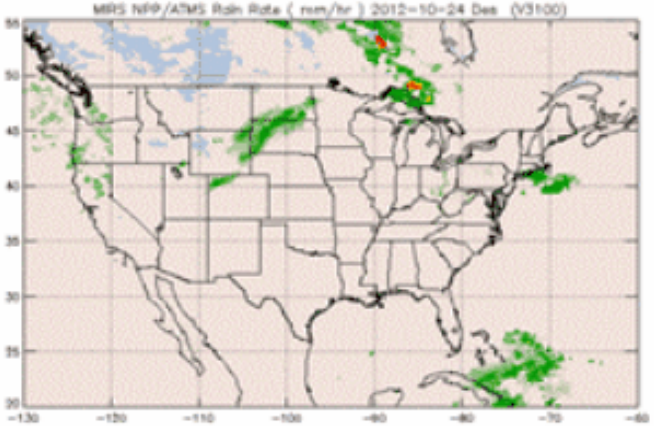
- Short- and medium-term forecasting
- Storm tracking

Resolution: ATMS vs. AMSU



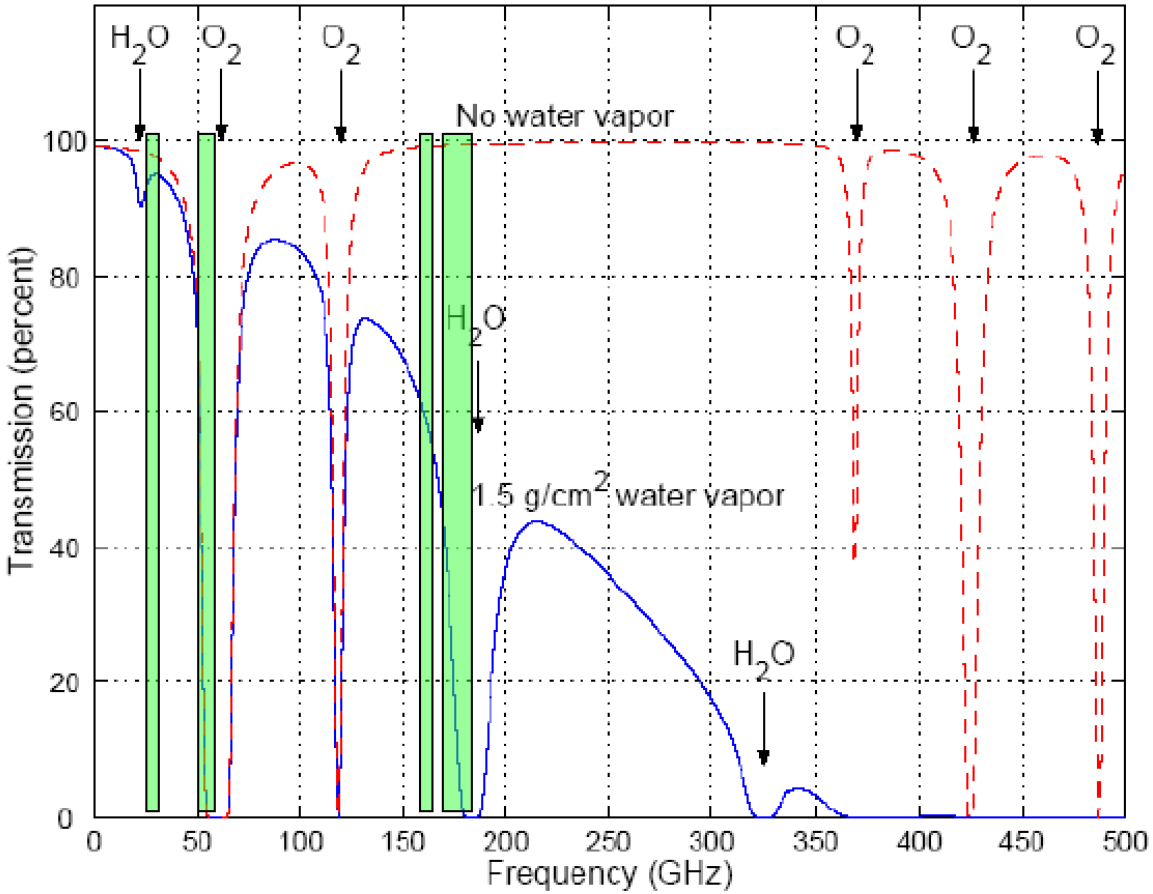
Higher resolution—Wider swath—Much smaller gaps between passes



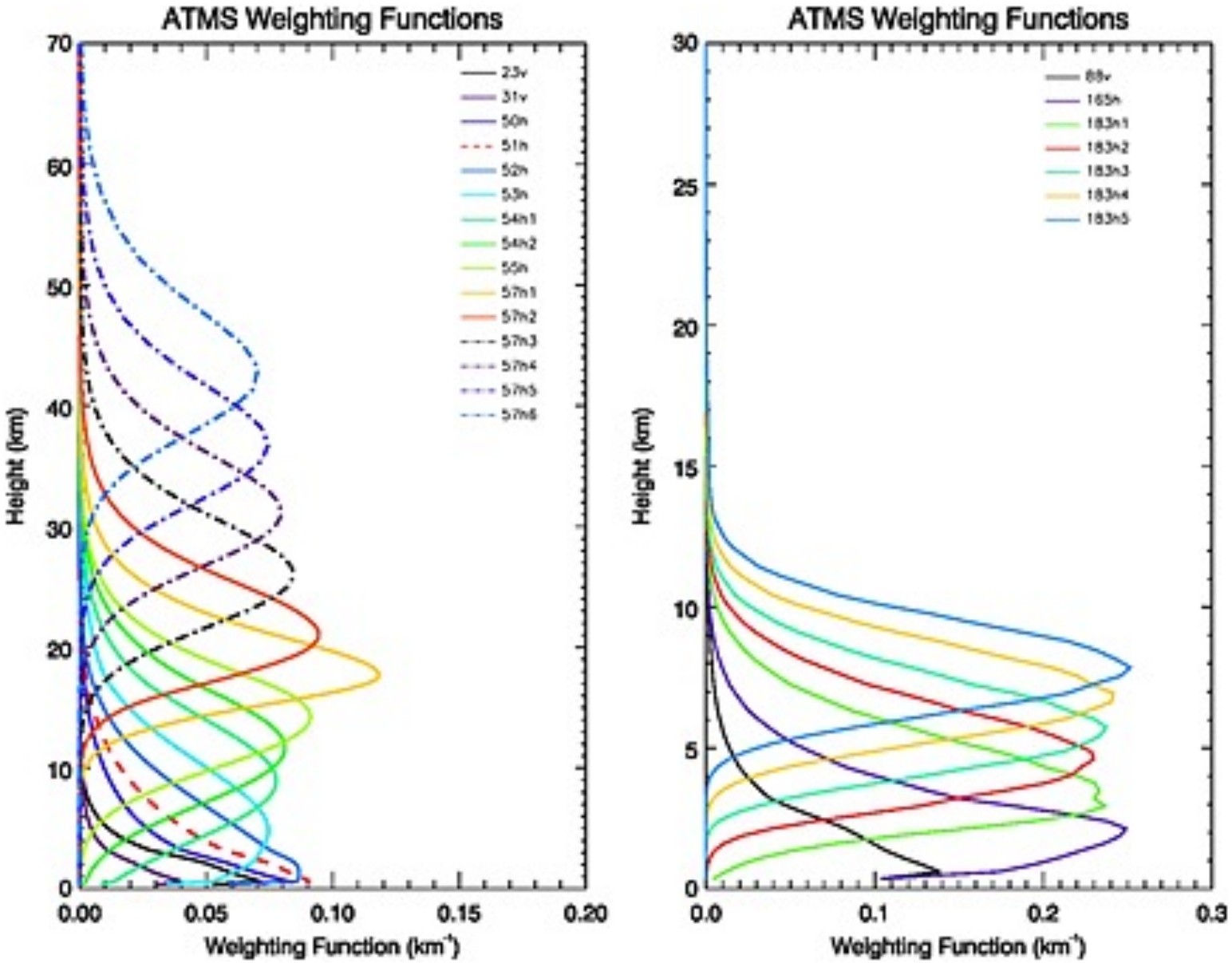


Rainfall rates during Hurricane Sandy

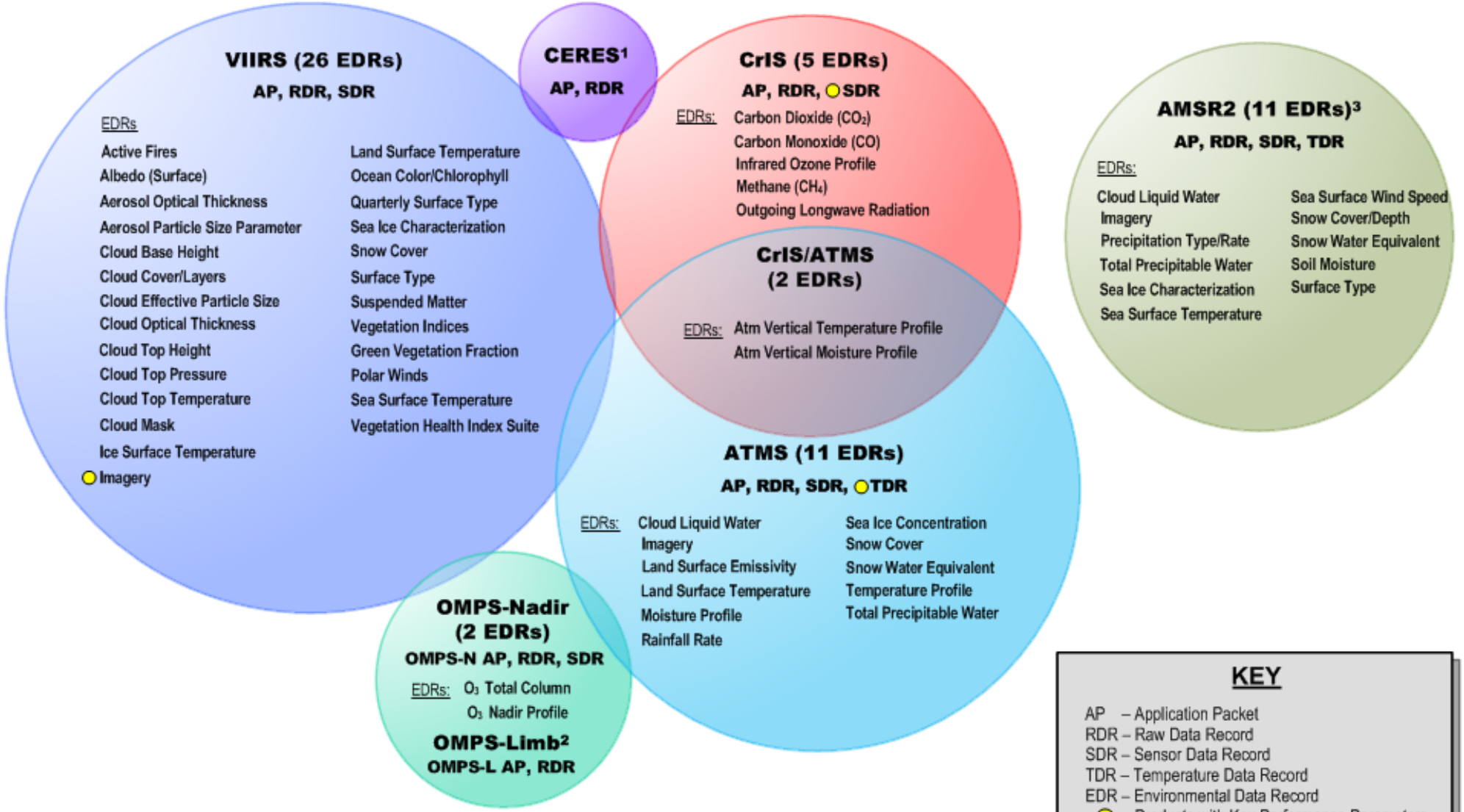
ATMS – channels are selected to observed atmospheric temperature, water vapor, surface emission, scattering



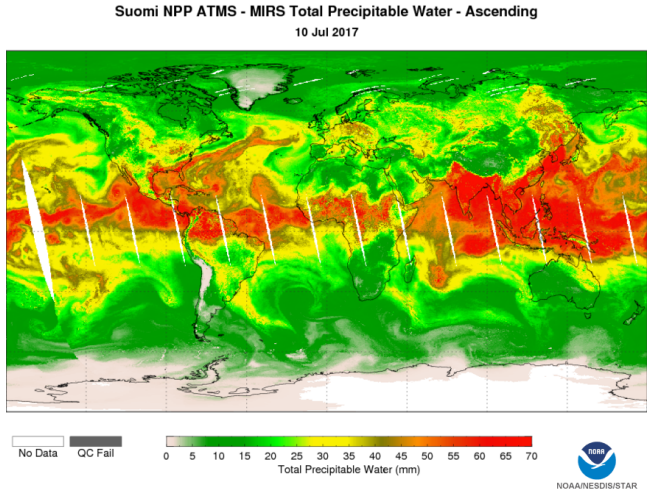
ATMS Weighting Functions

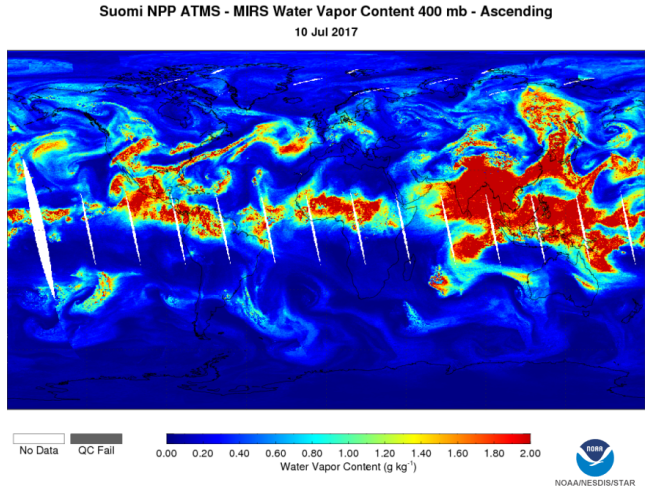


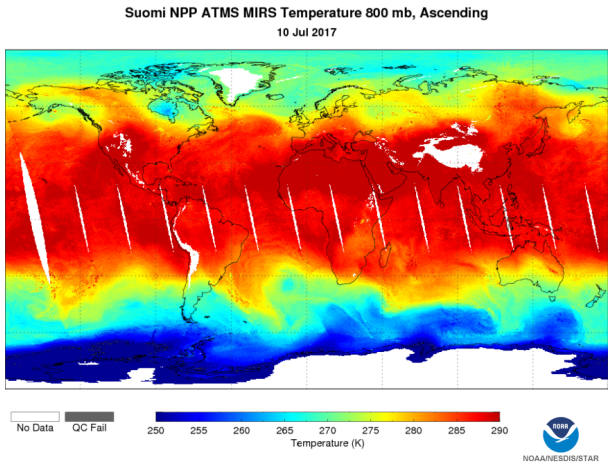
JPSS Program Data Products

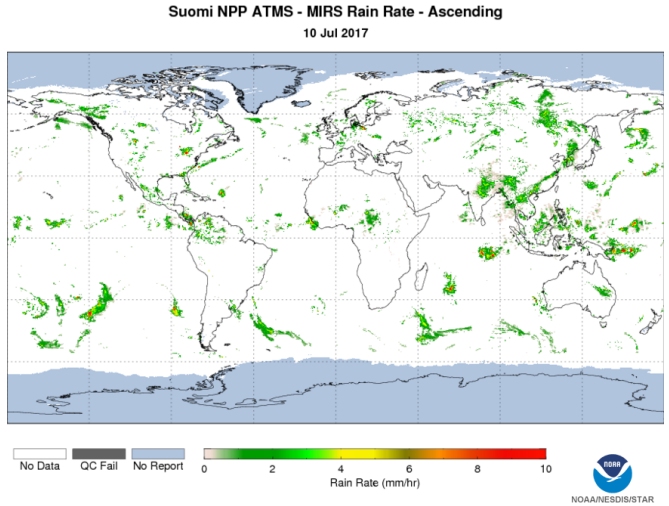


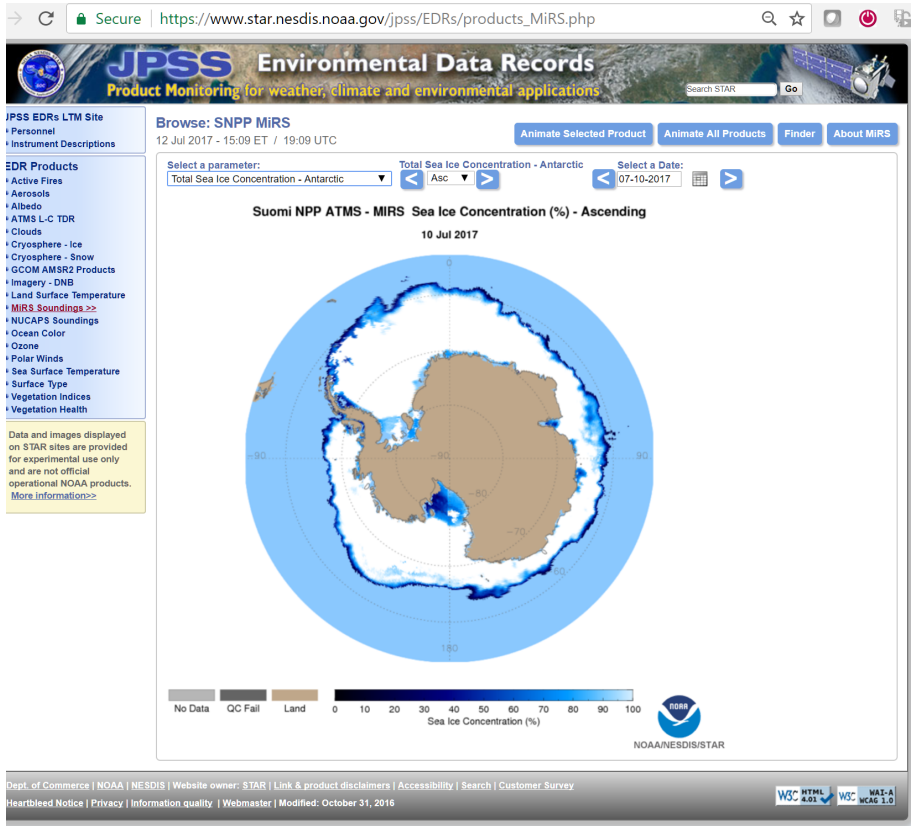
ATMS Products





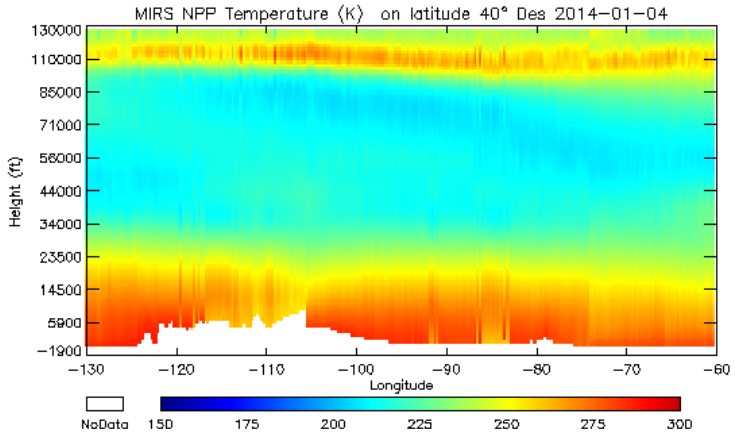


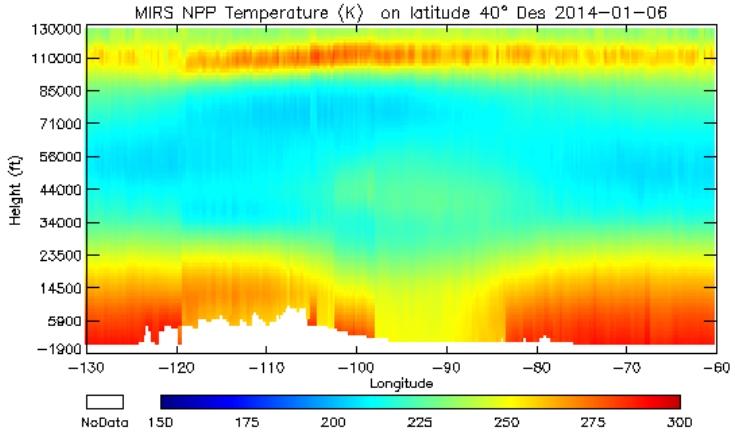


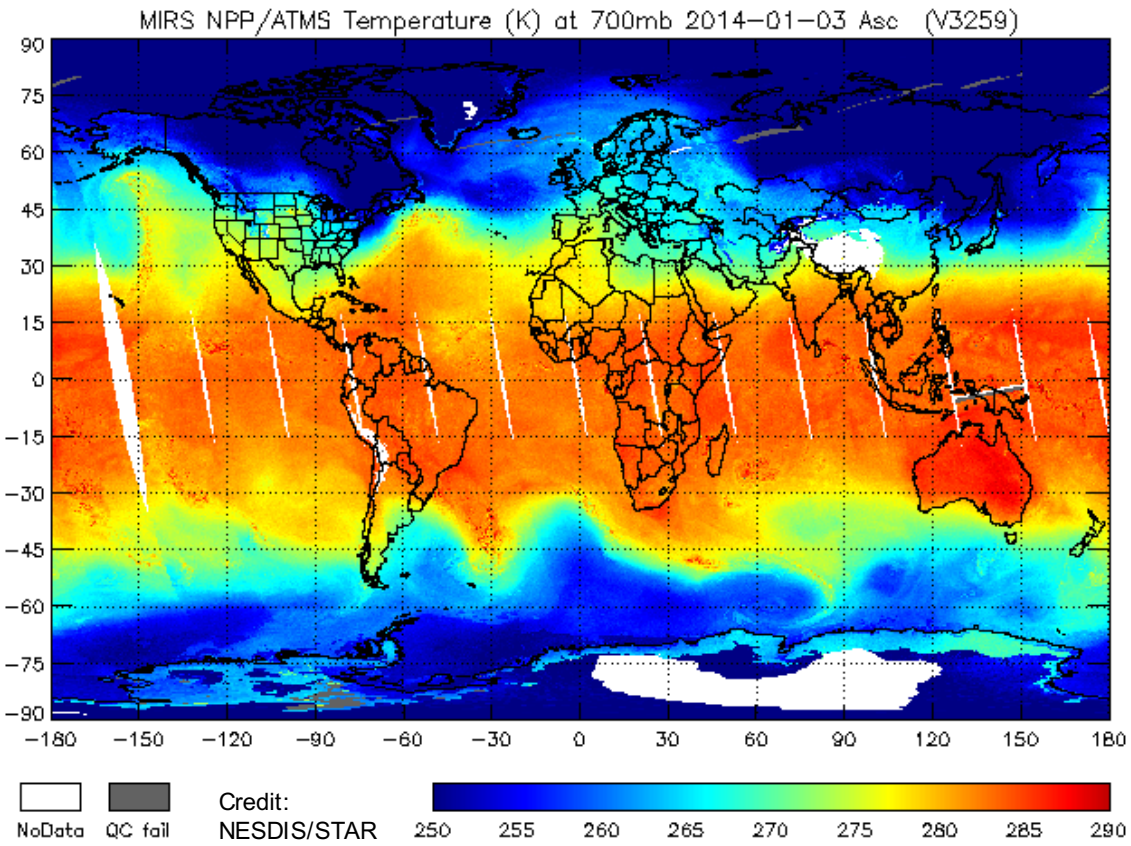


https://www.star.nesdis.noaa.gov/jpss/EDRs/products_MiRS.php

Example of lower tropospheric Temperature

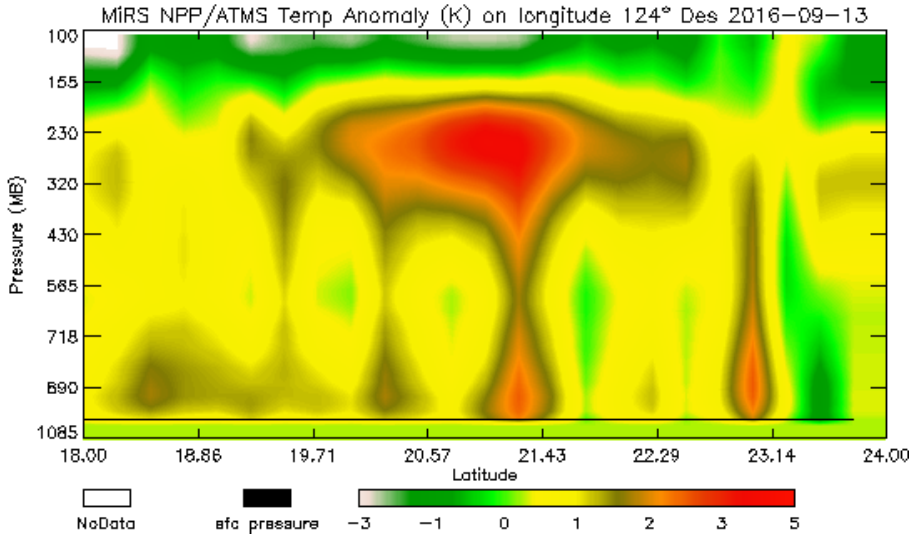


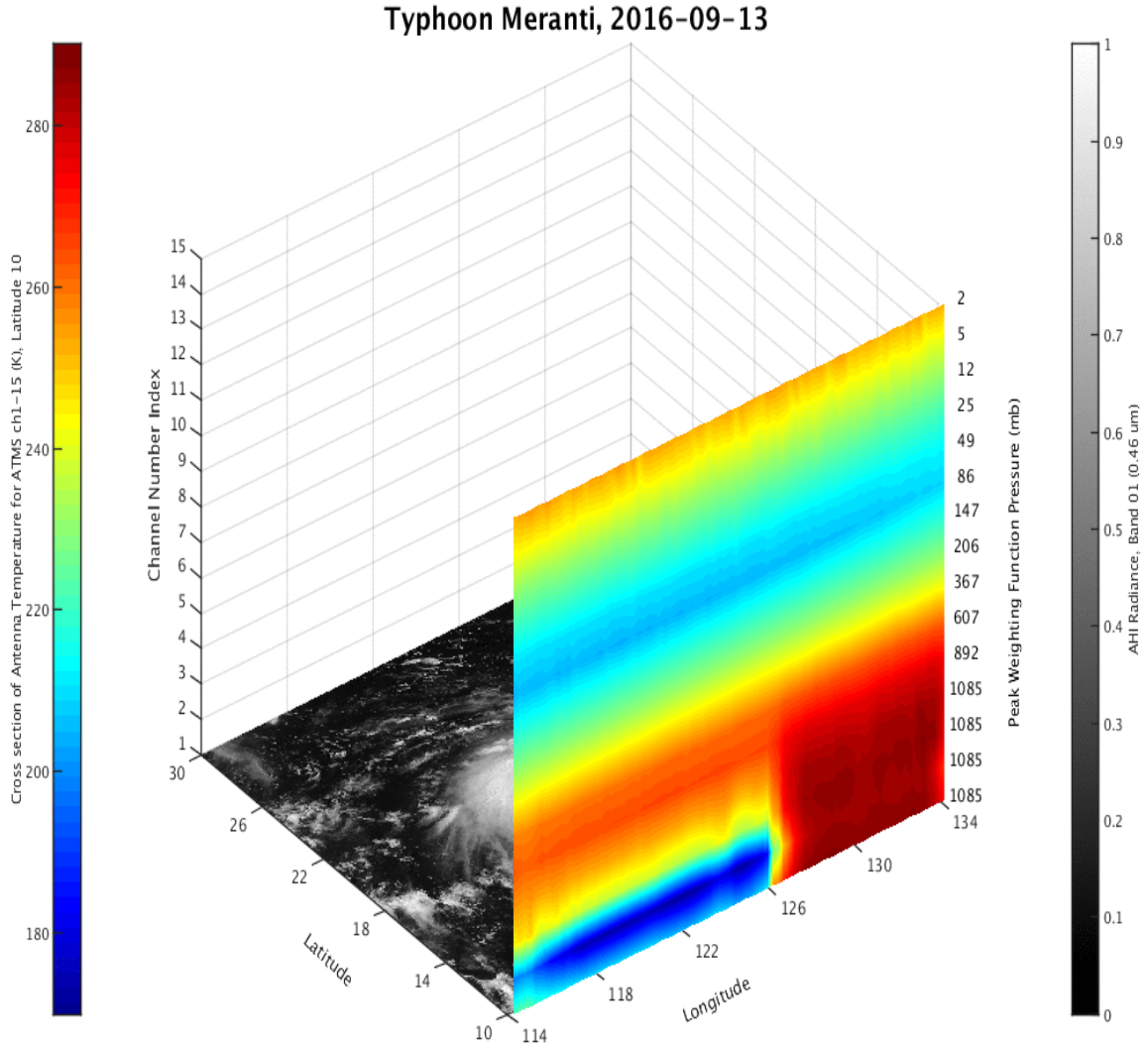




ATMS penetration of clouds reveals the transport of the Polar Vortex that impacted the US with large swath of record cold temperatures. The peak for DC area was 1/7/14. Above left are vertical cross-sections of temperature comparing January 4 with January 6, showing normal air temperature at ~ 23000 feet (-45 to -10 F, Winter) reached the surface on 1/6/14.

ATMS Measures Vertical Profiles



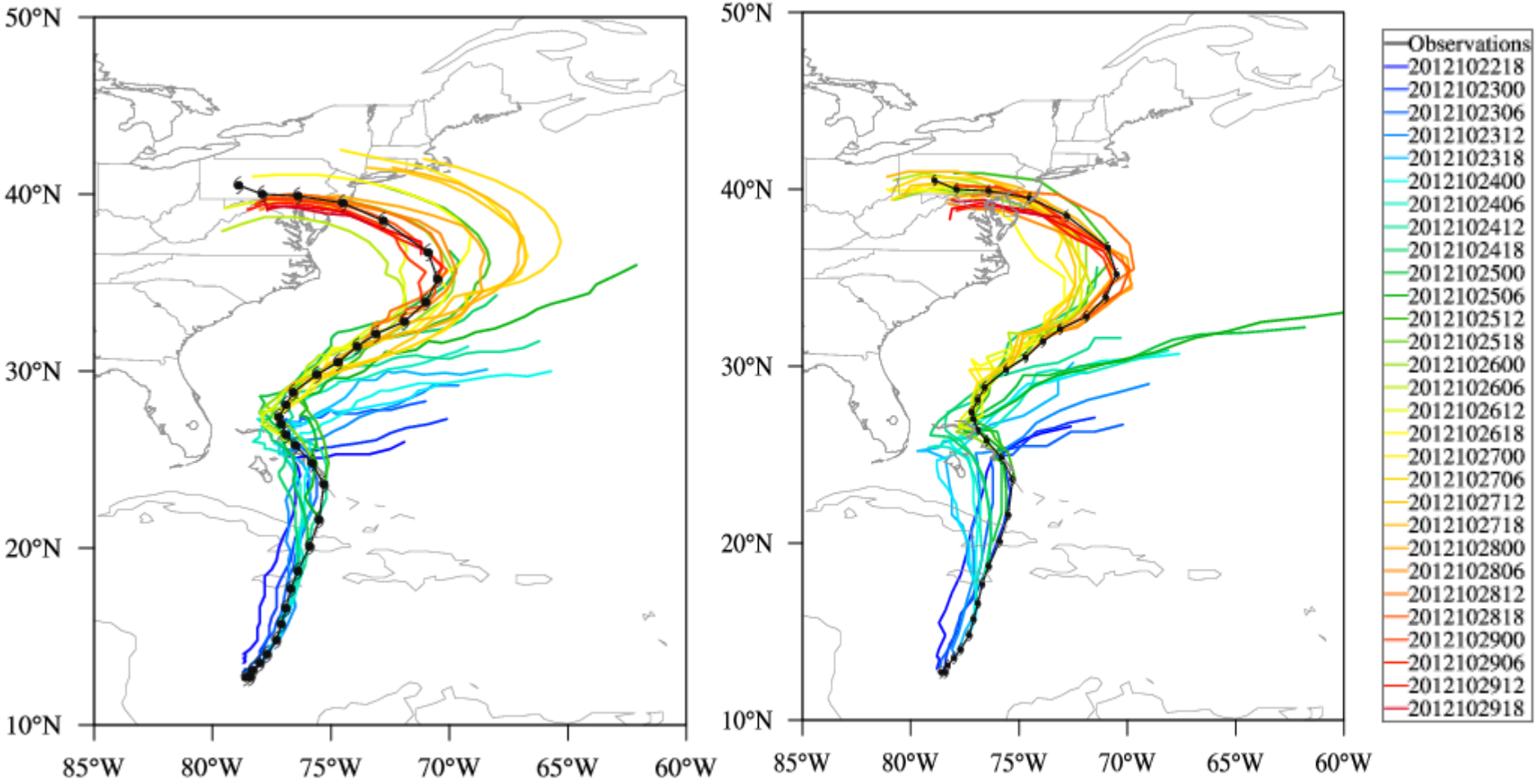


Direct Assimilation of ATMS into Models

Experimental results showing improvements in Sandy track forecasts from Hurricane Weather Research Forecast model with ATMS

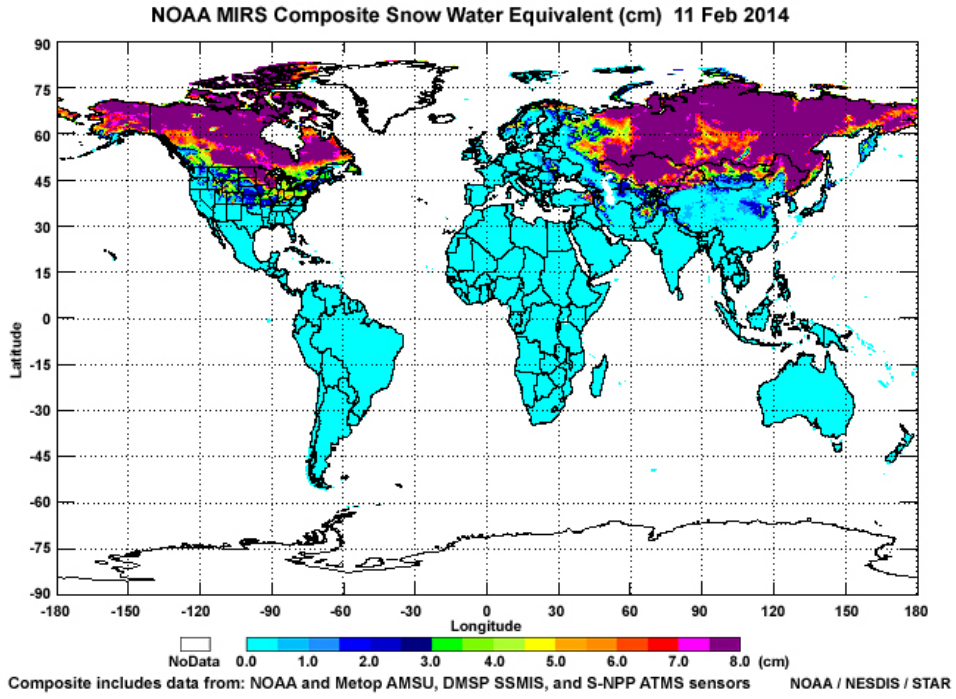
HWRF-NCEP Operational

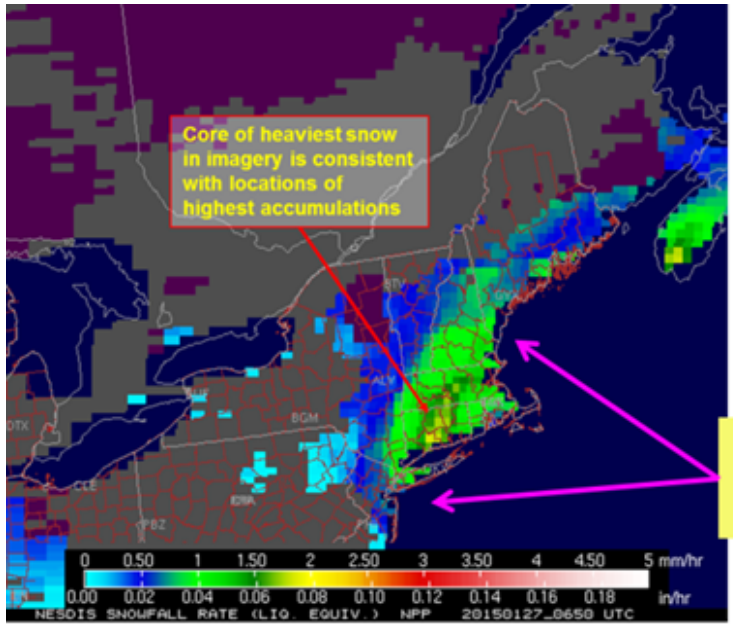
Modified HWRF-NCEP with ATMS



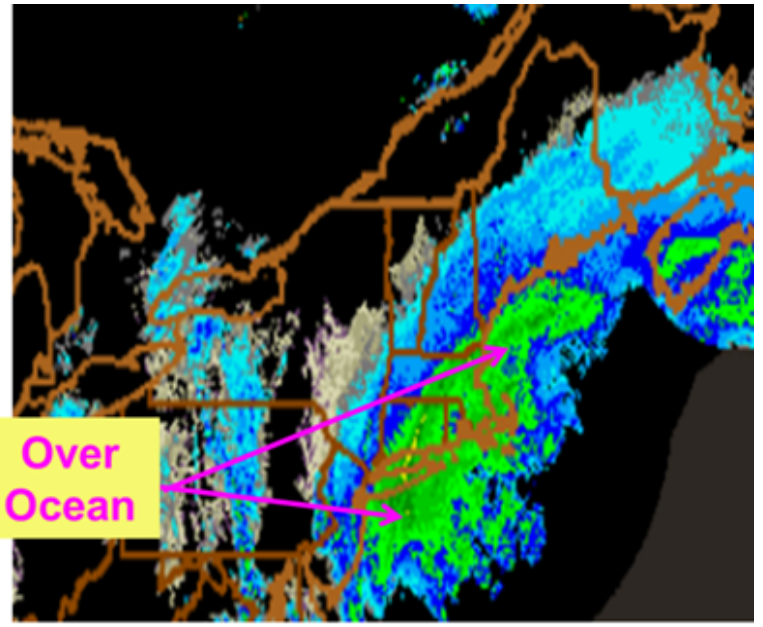
Thanks to Fuzhong Weng

ATMS Monitors Snow



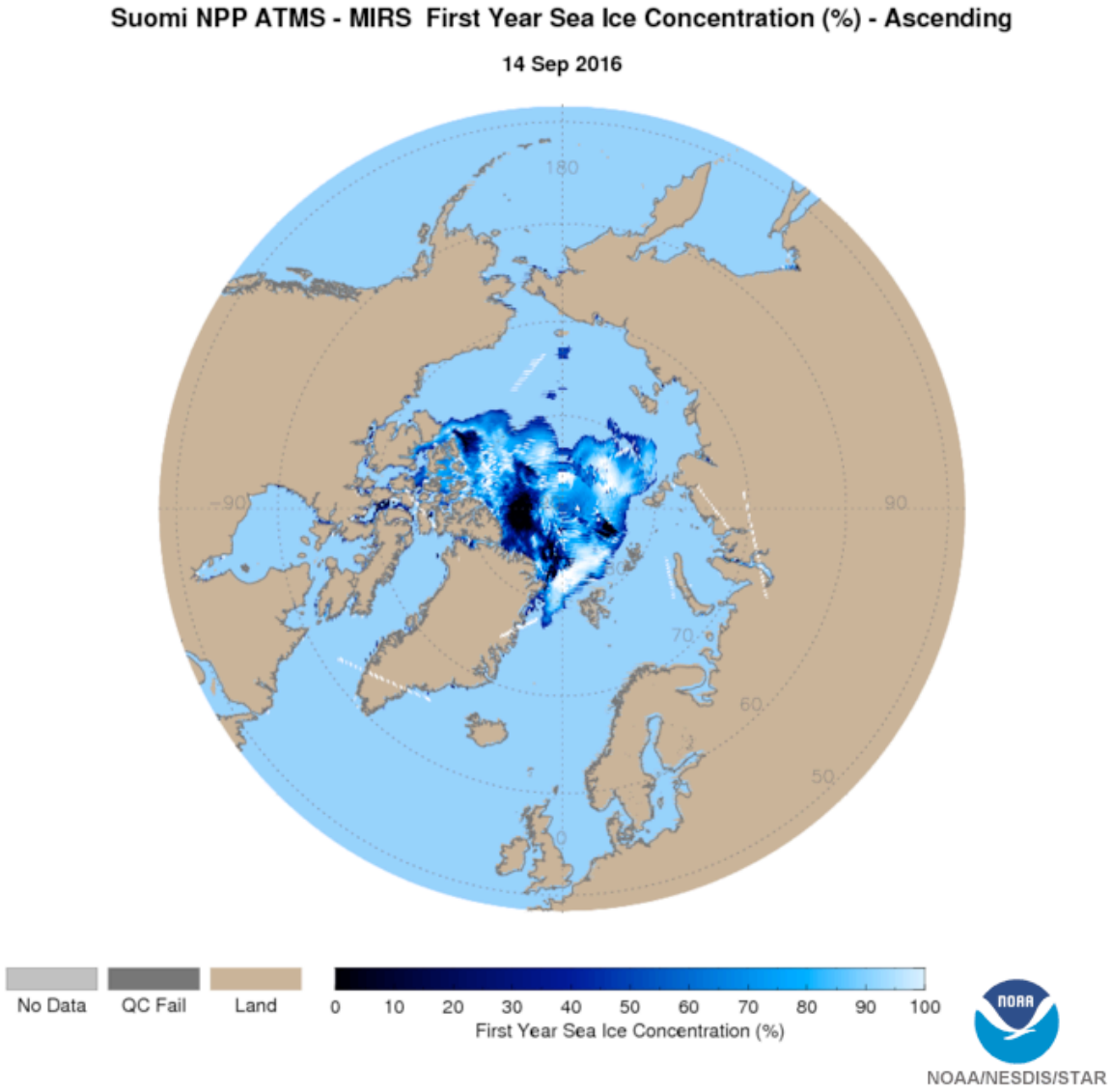


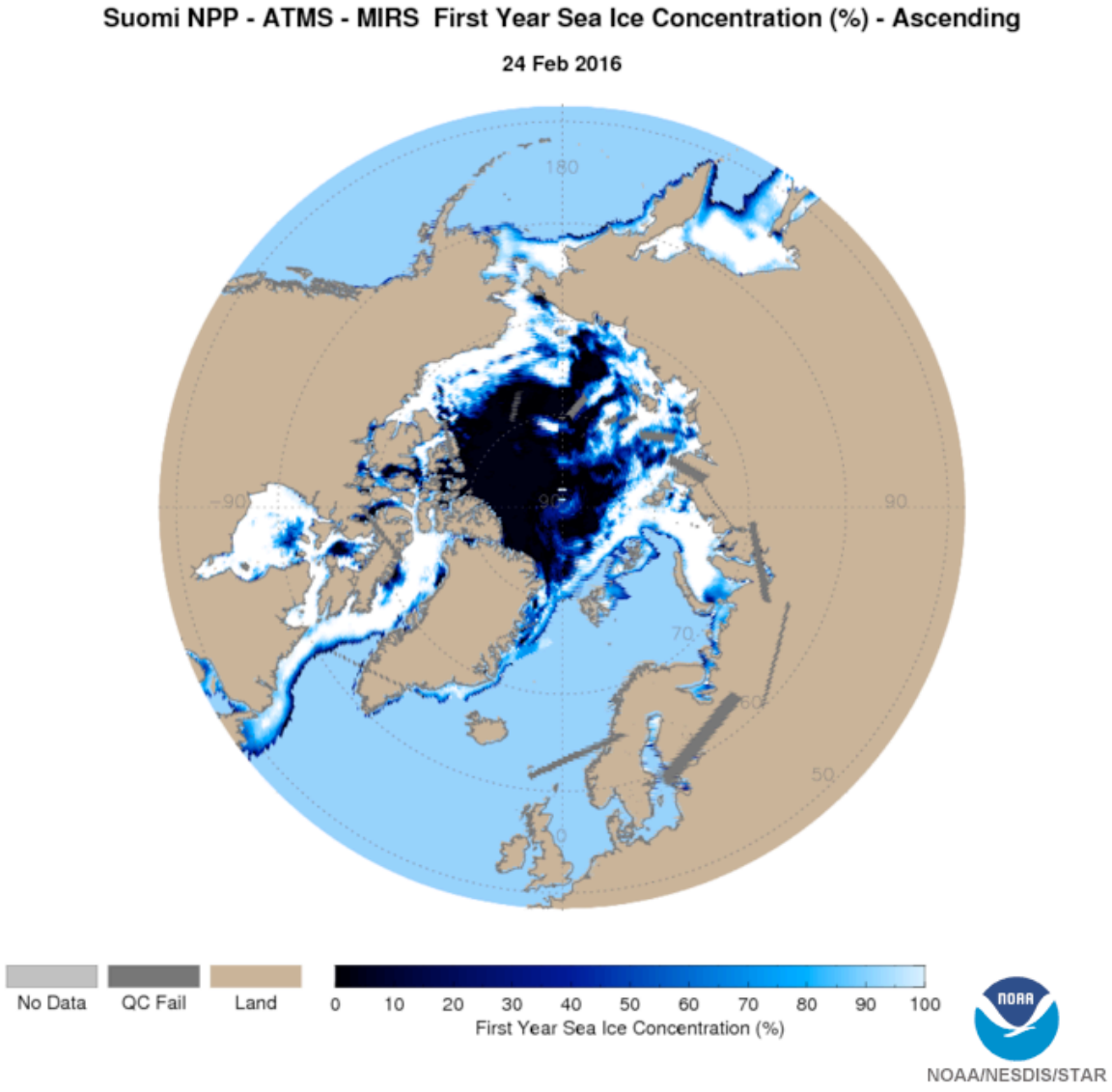
ATMS SFR



Radar Reflectivity

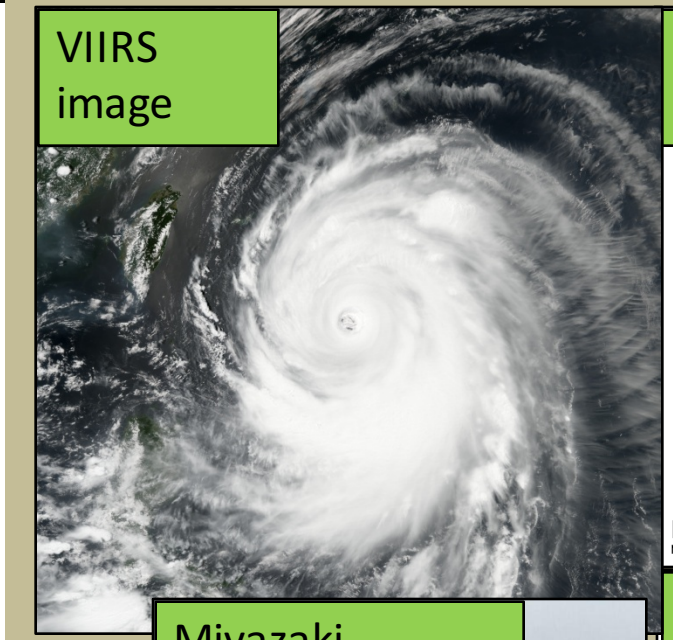
ATMS Monitors Ice



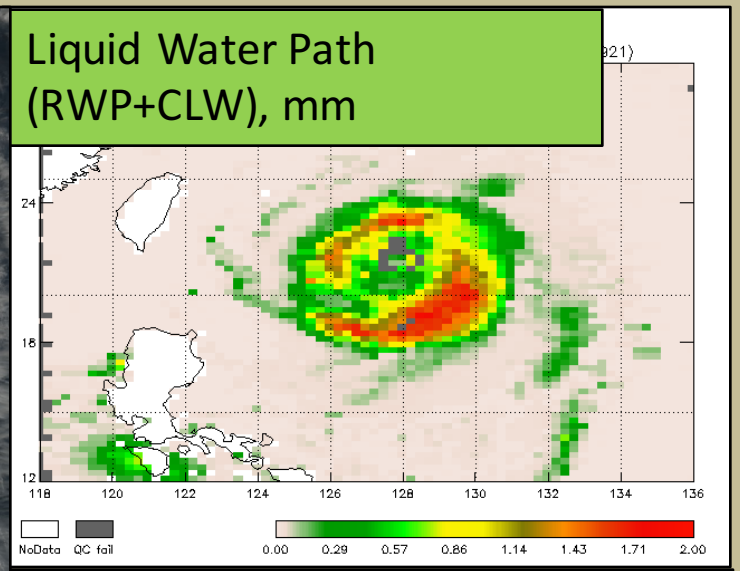


MiRS V11 Rainfall: Typhoon Neoguri on 7 July 2014

VIIRS image



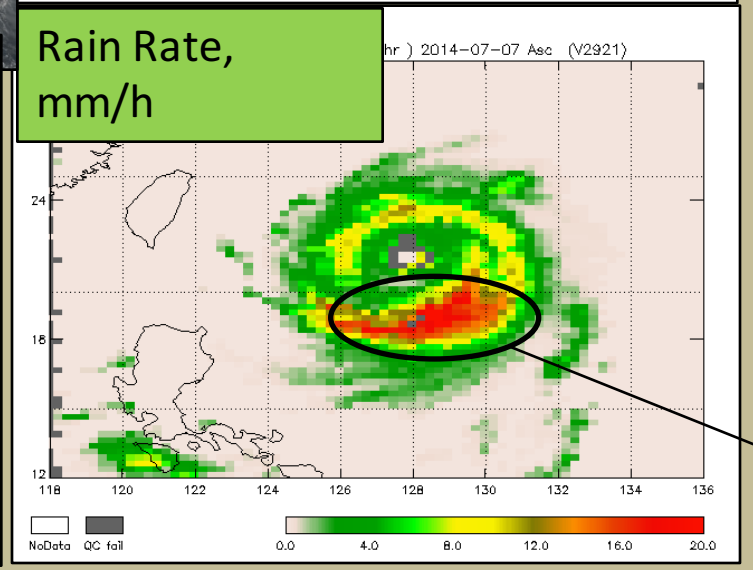
Liquid Water Path (RWP+CLW), mm



- SNPP/ATMS data
- Cyclone impacted Okinawa on 8 July

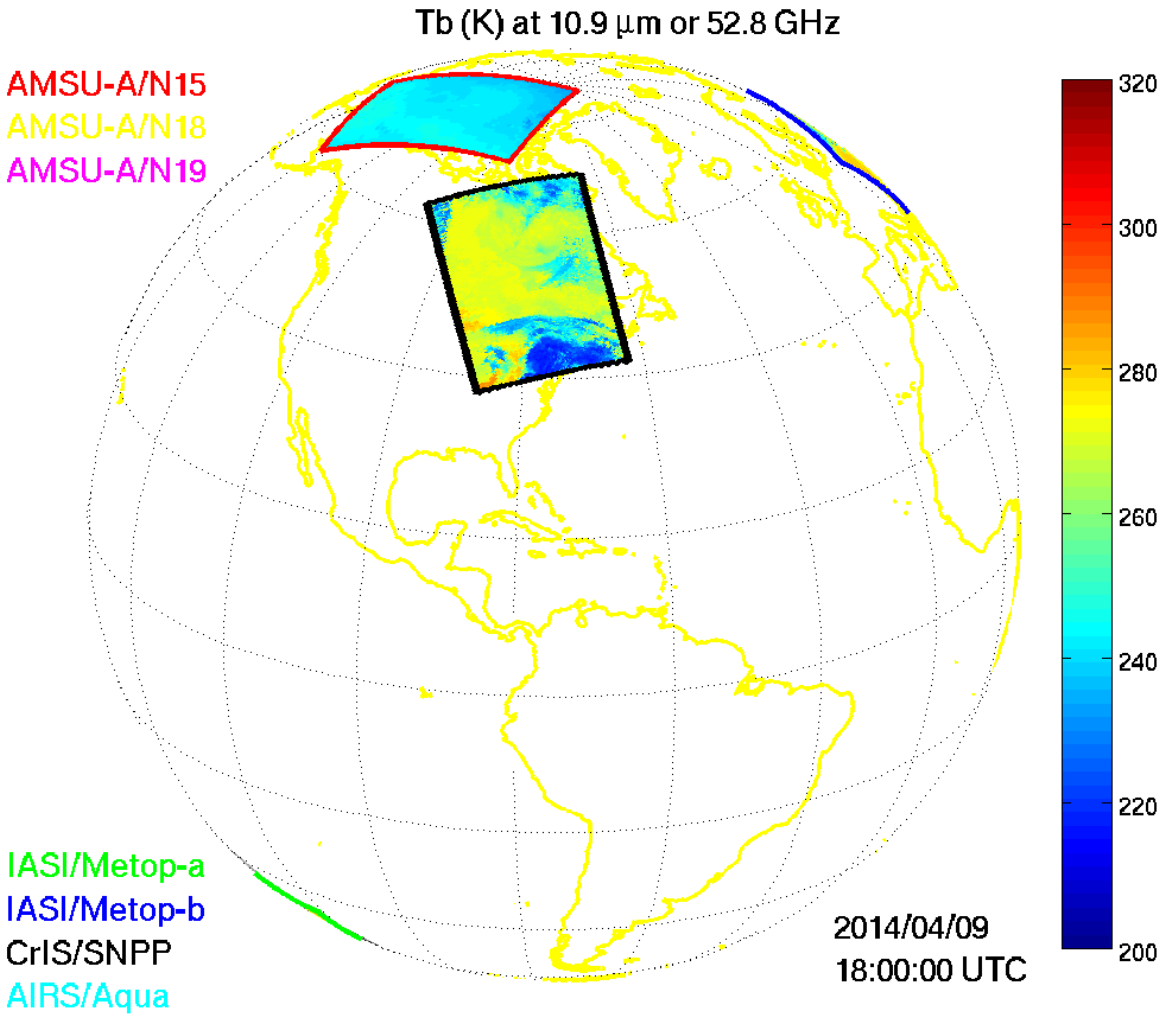
Miyazaki Prefecture

Rain Rate, mm/h

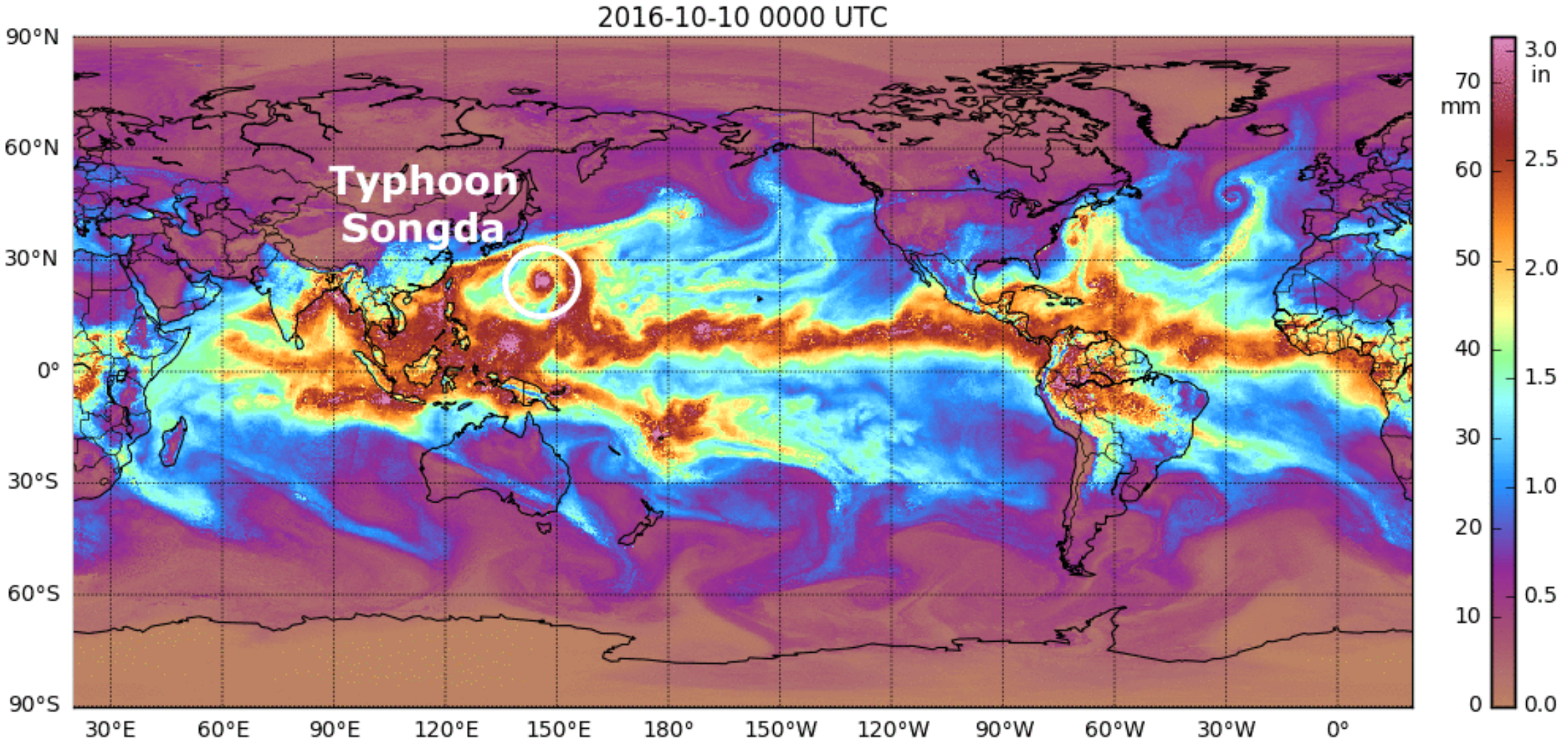


RR > 20 mm/h consistent with reports post-landfall (e.g. 340 mm in 24 h)

Multiple Orbits Create Better Coverage



Atmospheric Rivers from Microwave Sounders



Summary

ATMS and our legacy microwave sounders provides critical data for weather forecasting.

The microwave products are used for many nowcasting, hydrological and climate applications including:

- Hurricane intensity
- Rainfall rates
- Snowfall rates and snow water equivalent
- Snow and Ice monitoring
- Long-term records of atmospheric temperature and water vapor.